

Date: March 3rd, 2015

To: Washington State Department of Ecology

From: Jeremy Martin, Ph.D., Senior Scientist

Subject: A clean fuels standard is a smart policy for Washington

Dear Department of Ecology,

On behalf of more than 15,000 supporters Washington supporters of the Union of Concerned Scientists (UCS), thank you for the opportunity to comment on the Washington Clean Fuel Standard (CFS) discussion document. UCS strongly supports the CFS policy, and which would help cut Washington's oil use and will complement other measures in other sectors to protect Washington's citizens from the worst impacts of climate change. Moreover, by creating a stable science-based policy framework that recognizes that cleaner fuels are more valuable than dirtier fuels, the policy will support investment in clean fuels production, bring down the costs of clean fuels, and encourage the development of the clean fuels industry in Washington.

Clean fuels will cut oil use and reduce carbon pollution

UCS research and analysis on vehicles and fuels has demonstrated the potential to cut projected oil use in half over the next twenty years through a focus on improved efficiency in all our uses of oil, together with expanded production of innovative clean fuels¹. Two of the clean fuels with the greatest potential to cut oil use and reduce carbon pollution from transportation are electricity as a transportation fuel and cellulosic biofuels.

Washington's clean electricity is an important local clean fuel asset

Electricity is already a lower cost fuel than oil. Washington has relatively low electricity costs, making an EV more affordable to drive than a gasoline powered vehicle. Driving an EV in Washington 100 miles in 2014 cost an average of \$2.60, compared with an average cost of \$12.70 for a comparable gasoline-powered vehicle (see attached fact sheet for calculations and references). Electricity is also a very clean fuel, particularly in Washington. UCS analysis demonstrates that driving an electric vehicle in Washington produces carbon pollution equivalent to driving a car with a mileage rating of 170 mile per gallon². With

¹ For more details on UCS's plan to cut projected oil use, see ucsusa.org/halftheoildetails.

² See recent analysis from the Union of Concerned Scientists, Clean Fuels for Washington.... at <http://www.ucsusa.org/clean-vehicles/better-biofuels/clean-fuels-washington>

Washington's abundant supply of affordably priced low carbon electricity, this is a fuel pathway that is poised to expand under a clean fuel standard, protecting consumers from high and volatile oil prices and reducing oil imports into the state. Moreover, the carbon pollution associated with driving an electric vehicle will continue to improve as Washington's utilities decrease their production and procurement of electricity from coal and increases their share of electricity from renewable sources.

Washington has great potential to produce advanced biofuels

The use of biofuels in the United States has grown by 500% over the last 10 years, demonstrating that the US fuel system can change quickly in response to policy signals and that compliance with the Washington Clean Fuels Standard is eminently feasible. While the growth of biofuels over the last decade was dominated by corn and soybean oil, the Washington Clean Fuels Standard has the potential to shift future growth of biofuels toward the cleanest, lowest-carbon resources. And with a science-based lifecycle metric that includes indirect land use change emissions (ILUC), the policy will recognize the benefits of biofuels produced from wastes and residues and provide an appropriate market signal in favor of these sustainable low carbon biofuel resources. Washington has significant biomass resources in both its urban wastes and residues from the forest products and agricultural sectors. Eastern Washington also has the potential to expand production of canola oil grown in rotation with wheat. These regionally specific resources can fit into Washington's fuel system while complementing rather than displacing the existing industries.

Washington State University is doing important work on sustainable low carbon biofuel feedstocks and conversion pathways as part of the Northwest Advanced Renewables project developing advanced biofuels from forest residues and University of Washington with the Advanced Hardwood Biofuels project to develop hybrid poplar energy crops that are suitable to Washington's climate. Biomass feedstocks are abundant, low cost and low carbon feedstock for biofuels, as described in a UCS report on biomass resources in the United States³. Both programs are focused on developing jet fuel replacement biofuels, which are important to help Washington's aviation business adapt to a low carbon future.

A growing body of work shows the clean fuel standard compliance is feasible

In February, UCS, together with the Natural Resources Defense Council and the Environmental Defense Fund, released a study, conducted by Promotum, which found that with stable policies we can achieve ambitious clean fuels goals. Recent publications from UC Davis, the International Council on Clean Transportation and E4Tech have drawn similar conclusions. As jurisdictions up and down the coast move forward with Low Carbon and Clean Fuel Standards, we are seeing clear evidence that diverse types of clean fuel can make significant contributions to cutting oil use and transportation carbon pollution. For more details and links to these studies, please see my recent blog [Low Carbon Fuels: How Clean Fuels Can Power the West Coast and Beyond](http://blog.ucsusa.org/low-carbon-fuels-california-610)⁴.

³ See UCS 2012 report, "The Promise of Biomass: Clean Power and Fuel – If Handled Right" available on-line at http://www.ucsusa.org/sites/default/files/legacy/assets/documents/clean_vehicles/Biomass-Resource-Assessment.pdf

⁴ Available at <http://blog.ucsusa.org/low-carbon-fuels-california-610>.

Stable clean fuels policy will bring down costs

While the underlying economics of biomass-based fuels look very attractive over the medium and long term, the key hurdle to the realization of this potential has been raising capital to scale up production capacity. A stable progressive policy framework like the Washington Clean Fuels Standard is well designed to provide the durable growing market for clean fuels that will support investment in these innovative low carbon local alternative fuel pathways.

Experience with environmental regulations has shown that forecasts of costs tend to be too high, and forecast benefits too low. This is true of policies like phasing lead out of gasoline, or policies supporting renewable energy. Many of the low carbon fuels available today are less expensive than current fuels, and innovative next generation advanced biofuels offer opportunities to scale up production of extremely low carbon fuels. While initial production of cellulosic biofuels will likely have higher costs, as producers get experience the costs of the new clean fuels will come down. The flexibility of the Clean Fuels Standard will enable many innovative clean fuel pathways to compete, and this competition will also serve to keep costs low.

However, instability in the policy framework governing clean fuel markets is currently a major barrier to entry. This barrier is particularly significant for fuel such as cellulosic biofuels that have low cost feedstocks, but higher capital costs. These technologies require several years to finance, build, and start up, so until there is predictable policy framework extending several years into the future, it will be difficult to finance these large investments. The Federal Renewable Fuels Standard Long term policy frameworks such as the Washington Clean Fuels Standard and coordinated policies in other members of the Pacific Coast Collaborative will expand the market for low carbon cellulosic biofuels, supporting investment and bringing costs down over time. This is a point I addressed in a recent blog [Production Begins at Second Cellulosic Biofuel Facility](http://blog.ucsusa.org/production-begins-at-second-cellulosic-biofuel-facility-687)⁵.

A well designed cost containment mechanism can enhance stability

While a stable progressive policy framework should keep costs in check, a well-designed cost containment provision can enhance investor confidence that any short term mismatch between supply and demand will not result in a change of policy. Short term spikes in credit prices under the federal biofuels policy created a great deal of political uncertainty about the future of the policy, and that uncertainty is currently suppressing investment as investors wait to see how uncertainty in the policy is resolved. Strong clean fuels policies that scale up predictably and include clear contingency plans up front, will provide investors confidence to get out ahead of demand, which will ultimately keep prices from ever reaching the credit price ceiling in the first place. The credit clearance mechanism currently proposed by the California Air Resources Board is a good model for Washington to consider. Recognizing that a competitive clean fuel marketplace is the best long term way to bring down the cost of clean fuels, a containment provisions targets should be set high enough to draw in investment. A price ceiling of at least the \$200/ton being considered in California provides an adequate protection against destabilizing price spikes, while still allowing sufficient flexibility to draw investment.

Projections of early over-compliance are evidence that the standard is achievable

⁵ Available online at <http://blog.ucsusa.org/production-begins-at-second-cellulosic-biofuel-facility-687>.

Some critics of the CFS have argued that studies that show early over-compliance and later draw down banked credits reflect a world in which direct compliance is not possible. This is not a correct interpretation of such curves. Instead early over compliance is a natural consequence of a gradual ramp, which does not exhaust the low cost compliance opportunities in early years. This in theory could be eliminated by setting a compliance curve that ramped up more quickly, calibrated to fully exploit all expected potential opportunities for low cost early compliance. This would eliminate the potential to bank early credits, but it would make compliance less feasible rather than more feasible. The fact that models expect obligated parties to bank early credits reflects that compliance is less stringent than forecasted fuel availability.

Cost projections overstate clean fuel costs, underestimate flexibility and competition

Some critics of clean fuels policies have argued that the cost ceiling can be used to estimate the likely compliance costs and incremental fuel price increases associated with the clean fuels standard. This is based on an unrealistic assumption that all required credits will be purchased at the highest marginal price. This is a mischaracterization of the way the policy works. A great deal of low carbon fuel is available today at significantly lower costs even than current fuels, and certainly far below a potential credit price ceiling. Examples include low carbon electricity, low carbon sources of ethanol, biodiesel and renewable natural gas. In the event that the last incremental source of compliance is in short supply, for example because of bottlenecks in distribution infrastructure or production capacity, this last increment of credits might reach the cap price. However, even if this occurs, existing low carbon fuel sources will not rise in cost to match the marginal credit price unless there is collusion between the providers of low carbon fuel, which is illegal, and owing to the diverse sources of low carbon fuel would be relatively hard to organize and easy to detect.

In the event that the price of the last incremental source of low carbon fuel reached the cap, the availability of sustained demand at high credit prices would bring very rapid investment to address any bottlenecks in infrastructure or production capacity, ensuring that credit prices would quickly fall.

Consider an illustrative example based on currently available fuels. Lower carbon sources of ethanol have provided the largest source of compliance with the first years of the California Low Carbon Fuel Standard (LCFS), but further utilization of this pathway is constrained not only by the availability of low carbon ethanol, but by the limited infrastructure to distribute ethanol beyond the 10% blending level (E10). However, there is a sizable population of flex fuel vehicles on the road in Washington today that can run on an 85% ethanol blend (E85), and most new vehicles entering the marketplace today are certified to run on 15% ethanol (E15). A lack of fuel distribution infrastructure currently constrains the ability of these vehicles to access higher blends of ethanol, but this is a circumstance that can be remedied relatively quickly and cost effectively. With fueling infrastructure in place, selling additional volume of low carbon ethanol is a very cost effective means to generate additional compliance credits. At a credit price of \$200 a ton, and carbon intensity of 40 g/MJ, each flex fuel vehicle that begins fueling up with E85 can generate two tons of additional compliance value per year, in addition to 400 advanced RINs under the federal RFS. With credit prices at this level, providing low carbon ethanol to these customers is a very profitable business, and investments to build the infrastructure required to break through the blend wall would be very profitable as well. Pouliot and Babcock did a detailed economic assessment of

this opportunity⁶, and specifically critiqued an oil industry argument that biofuels policies would lead to a gasoline price spikes or shortages rather than investment in needed infrastructure to relieve distribution bottlenecks. The Pouliot and Babcock analysis is addressed primarily to the EPA's Renewable Fuels Standard, but the logic applies also to Washington Clean Fuel Standard, and the combination of both federal and state compliance opportunities makes the economics much more favorable to break through the blend wall in Washington to generate additional low cost compliance opportunities.

One key point here is that while high credit prices may provide the initial impetus to expand ethanol distribution infrastructure, either an incentive to distributors or as an avoided cost to obligated parties, once this infrastructure is in place, the competitive fuel distribution marketplace will rapidly bring down margins on all available fuel blends and presumably credit prices as well. Any additional costs imposed on obligated parties choosing to produce only high carbon fuels will be offset by added revenues for producers of low carbon fuels. Thus the assumption that the compliance cost of the policy is simply the product of the credit price and the program stringency significantly overstates the likely real costs.

Investments in clean fuel technology will bring costs down as firms learn from experience

The complex interplay of the many fuels, fuel blends and vehicle combinations can obscure the basic logic of a Clean Fuels Standard, which creates a competitive market for low carbon fuels that will quickly bring the cost of producing these fuels down. A simplified scenario more clearly illustrates this dynamic, which I addressed in a recent blog [Policy Matters: Why Clean Fuels Forecasts Come Up Short](#).⁷ I created a model in which only one low carbon fuel is available, initially at high cost, which illustrates how fuels costs will change over time as the stringency of the policy scales up and fuel producers get more experienced and bring costs down. My model, which is available for you to modify as you see fit, shows that even if the theoretical low carbon fuel initially costs twice as much as conventional fuel, the interplay between learning and rising stringency will lead to fuel prices per gallon that peak only 2% higher than they started, and then start falling. Taking steadily improving fuel economy into consideration, weekly fuel costs fall almost from the start. Despite these very modest price impacts and negligible consumer costs, the marginal credit price in the first year in such a scenario would exceed \$300/ton, falling to \$150 a ton in year 5 and \$30/ton in year 10. Because this example ignores the many low cost compliance options available to obligated parties, it dramatically overstates the potential costs of the policy. However, it illustrates the negative impact of setting a cost compliance threshold too low to draw investment, as this investment creates the competitive marketplace that ultimately brings costs down more effectively than a cost containment mechanism.

Up-to-date to lifecycle analysis

The strength of a performance based policy like the Washington Clean Fuels Standard rests on the accuracy of the lifecycle assessment used to score different clean fuels. Using the latest updates to GREET, including up-to-date information on upstream emissions from the oil industry from OPGEE, the most current information on the Washington electricity grid and including the latest updates the indirect land use change emissions analysis will ensure the regulation has a sound analytical foundation. Moreover, consistency with adjacent

⁶ Several recent papers on this topic by Pouliot and Babcock are posted at <http://www.card.iastate.edu/facstaff/profile.aspx?id=13&show=pubs>

⁷ Available at <http://blog.ucsusa.org/clean-fuels-forecasts-lcfs-705>.

jurisdictions in California and Washington will minimize fuels moving to take advantage of differences in analysis, and provide fuel producers a coherent market signal as they optimize their operations to minimize emissions.

I understand that some stakeholders are arguing for a drawn out process to continue debating the merits of indirect land use change emissions or to consider whether market mediated emissions impacts of fossil fuels should also be included in Washington's rules. Such a course would be a time-consuming distraction that would undermine the policy by injecting uncertainty without any tangible benefits. I have been an active participant in the technical work on and debate over fuels lifecycle analysis over the last 7 years, and while the modelling is challenging, and the results are will remain subject to considerable uncertainty, at this point the topic is no longer novel nor is the basic concept controversial. ILUC emissions are a pragmatic means of accounting in a science based fuel standard for the obvious fact that biofuels production impacts food markets. ILUC accounting provides biofuel producers a clear and tangible market signal to use wastes and residues when cost effective opportunities arise. Without ILUC accounting the preference for used cooking oil over food grade oil would be substantially eroded, and ethanol made from agricultural residues would be less able to compete with sugarcane ethanol. I have addressed this topic in a recent blog, [The Latest on Biofuels and Land Use: Progress to Report, but Challenges Remain](http://blog.ucsusa.org/the-latest-on-biofuels-and-land-use-797)⁸, and more detail is available in comments I submitted to the Air Resources Board in February.

Studies of market mediated emissions from crude oil production have not found significant or actionable adjustments, and further investigation is unlikely to be fruitful. However, the OPGEE model captures changes in the production of oil that are critical to accurately reflect that as biofuels and electricity are getting cleaner, oil is getting dirtier. Adopting rigorous accounting for oil's rising upstream emissions rather than prolonging the argument over ILUC or indirect impacts of oil will provide clarity, minimize administrative overhead, and allow the clean fuel market to move forward with minimal unneeded uncertainty.

Fossil Fuel Carbon Mitigation Pathways

Aside from investing in alternative feedstocks, the oil industry has opportunities to substantially reduce emissions from their own operations. Reductions in flaring associated with tight oil extraction, reduction in natural gas used for steam production in thermal enhanced oil recovery by phasing out inefficient wells, or shifting to renewable energy for steam production for enhanced oil recovery, and avoidance and/or mitigation of carbon intensive resources like tar sands all are available at potentially large scale. California is beginning to evaluate the potential of generating LCFS credits from certain innovative crude pathways. These pathways offer the potential for large quantity of credits to come on line very quickly, reducing carbon emissions and the cost of clean fuels standard compliance.

⁸ Available online at <http://blog.ucsusa.org/the-latest-on-biofuels-and-land-use-797>

Oil Industry Responsibility

Arguments by the oil industry against the Clean Fuels Standard should take into consideration the extent of their responsibility for climate change. A recent analysis published in the peer reviewed journal *Climate Change*⁹ concludes that nearly two-thirds of carbon dioxide emitted since the 1750s can be traced to the 90 largest fossil fuel and cement producers, most of which still operate. Chevron is the largest of these, joined by ExxonMobil, BP, Shell and ConocoPhillips in the top ten. While producers of ethanol, biodiesel, biogas and electricity are making investments to bring down the carbon intensity of their products, the oil industry's carbon intensity is rising. If obligated parties in the oil industry want to minimize their obligation to purchase low carbon fuels produced by other industries, they have ample technical potential to make emissions reducing investments in its own operations. In light of their role in creating the climate problem, a responsible company would do nothing less.



Sincerely,

A handwritten signature in black ink, appearing to read 'J. Martin'.

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⁹ *Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854-2010: Climatic Change*, online 21 November 2013.